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Two McKean County Bridges Replaced

By: Chris Ernst, P.E.

The replacement of the Fogel Crossing Road Bridge over the Allegheny Portage Creek in Liberty Township and the Champlin Hollow Road Bridge over Kings Run in Ceres Township were completed in November 2007. The design and construction of both projects were funded by the federal government (80%), the State of Pennsylvania (15%) and each of the municipalities (5%). Our firm completed the design of the bridge projects, with the assistance of our subconsultants, using PennDOT standards and under the direction of the PennDOT Engineering District 2-0 located in Clearfield, PA. Skelly and Loy, Inc. was the environmental subconsultant and Geomechanics, Inc. of Elizabeth, PA was the geotechnical subconsultant for both of the jobs.

The 56.5 ft. single span prestressed adjacent box beam structure that was installed on Fogel Crossing Road in Liberty Township replaced a 32.5 ft. single span steel pony truss bridge with a timber deck that was approximately 14.25 ft. wide between its railings. The new bridge has a reinforced concrete deck that is 22 ft. wide between reinforced concrete and steel rail barriers. The abutments and wingwalls are constructed of reinforced concrete.

The construction of the bridge project was let for bidding in March 2007 and the low bidder for the project was the R.L. Johnson Construction Corp. of Bakerstown, PA with a price of \$529,480.23. The R.L. Johnson Construction Corp. began the bridge project in the middle of June 2007. The prestressed adjacent box beams were supplied by Top Roc Newcrete Products of Erie, PA and the cast-in-place concrete for the project was supplied by the Wayne

Companies Coudersport, PA plant. Interstate Amesite paved the approaches to the new bridge and Green Acres Contracting Company, Inc. was hired to install the guide rail and the steel rail portion of the bridge barrier.



Fogel Crossing Road Bridge

The 29.7 ft. single span prestressed adjacent box beam structure that was installed on Champlin Hollow Road in Ceres Township replaced a 24.7 ft. single span steel stringer structure with an asphalt deck in stay-in-place corrugated metal deck pans. The old bridge was approximately 17 ft. wide between its railings. The new bridge has a reinforced concrete deck that is 22 ft. wide between the reinforced concrete and steel rail barriers. The abutments and wingwalls are constructed of reinforced concrete. A temporary roadway was constructed downstream of the bridge location to allow traffic to cross Kings Run during the replacement project.

The construction of the bridge project was let for bidding in May 2007 and the low bidder for the project was the L.C. Whitford Company, Inc. of Wellsville, NY with a price of \$517,561.29. The L.C. Whitford Company began the bridge project in late June 2007. The prestressed adjacent box beams and the cast-in-place concrete for the new abutments and wingwalls were provided by the L.C. Whitford Company. The cast-in-place concrete for the reinforced concrete deck was provided by the Wayne Companies and was installed by the L.C. Whitford Company. Interstate Amesite paved the approaches to the new bridge and Penn Line Service, Inc. was hired to install the guide rail.

Both of the projects were completed on time and under budget much to the credit of the contractors and to the E&M inspectors that worked on each job. Mike Reed was the inspector-in-charge at the Fogel Crossing Road site and Wendy Elensky was stationed at the Champlin Hollow Road location. The bridge replacement projects were also possible due to the hard work of both the Liberty Township and Ceres Township Supervisors and their staff.



Champlin Hollow Road Bridge

Practical Guidelines for Grease Trap Design

By: Jeffrey Bahret, PE

What's the deal with grease trap design? Given a design scenario of a 200 seat, 24 hour per day restaurant; a manufacturer's recommendation would be typically an in-kitchen 30 gallon canister, whereas, following the State or Federal design

guidelines would require an outside buried tank of olympic swimming pool proportions. Which is correct? Well, while an undersized grease trap may adequately meet the local plumbing authority guidelines, it will not usually meet pretreatment requirements. Whereas, the State or Federal design guidelines fall under the category of "there is no such thing as too big of a grease trap"; it is not cost-efficient engineering to burden a facility with unnecessary capital cost expenditures. We will attempt to clear-up some of the "smoke & mirrors" associated with grease trap design, and focus on the key items.

Why do restaurants and commercial kitchen facilities need grease traps on their kitchen waste lines? It is because of one of the following conditions:

1. ON-SITE DISPOSAL SYSTEM- The trouble arises when the grease and oil reaches the soil absorption field, cooling and solidifying to form a "waterproof" layer on the soil below the distribution pipe network, causing the failure of the system.

2. PUBLIC-SEWER DISPOSAL SYSTEM- The coating and clogging of a public sewer system with grease/oil can be a big maintenance problem for the collection system, pump stations and treatment facility. To abate this situation, public sewer systems through their "Use-Laws" will typically have a pretreatment requirement for grease/oil of 100 parts per million, but, can be as low as 50 ppm.

In general, kitchen facilities must be served by a separate sewer line in which a grease trap is placed upstream of the on-site treatment system or public sewer service lateral. The only exception to this rule, are kitchen sinks which contain garbage grinders. These disposal units cannot be placed on line with the grease trap, and must go directly to the septic tank or public sewer line.

These systems are difficult to design due to the fact that there are so many variables. We have isolated what we believe are the six key items in conducting a proper, cost-effective grease trap design:

1. PEAK FLOW RATE- Using a flow rate of 35 gallons per day, per seat, is fine for determining average daily wastewater volumes for a kitchen/cafeteria facility, but is pretty much useless when it comes to determining peak flow rates. This rate is the factor which must be determined for adequate grease trap design. Total the unload rate of the commercial dishwasher(s) (available from the manufacturer) and add 5 gallons per minute for each sink tied to the grease trap pipeline to determine the peak flow rate for design.

2. GREASE REMOVAL EFFICIENCY- The percentage of total grease which is to be separated from the waste stream is very important in the evaluation. A typical kitchen waste stream contains 300 mg/l of grease/oil. Depending upon the specific pre-treatment requirements, the facility may need to remove 50% to 90% of the total grease volume. This variable has a big impact on the trap design.

3. CLEANING CYCLE- How often can the grease trap be cleaned? Can it practically be done every month, or because of location, operation, weather, etc. only be cleaned every 6 months. This has a direct impact on the available grease storage volume factored into the trap design. Once the design storage volume is exceeded, the unit becomes ineffective, and removal efficiencies cannot be achieved.

4. MAXIMUM FLOW VELOCITY- Because it is necessary for the grease/oil to cool-down to solidify, the maximum longitudinal velocity through the tank must not exceed 0.25 inches per second. This maximum through-put velocity must be calculated for a given tank with its maximum grease storage volume factored into the equation.

5. GREASE PARTICLE “DWELL TIME” AND “RISE DIFFERENTIAL”- These items are key to the design since they describe the mechanical characteristics of the individual grease particles. The minimum dwell time is the period in minutes that a grease particle takes to move longitudinally across the grease trap. To realistically achieve most effluent limits, this value must not be lower than 5 minutes. A 300 micron droplet of oil at the average temperature of 70°F, will rise at a rate of 0.05 inches per second. Based on maximum velocities and minimum dwell times, the rise differential in inches must at the least equal the distance between the

bottom of the tank and the base of the grease layer, when the storage volume is at its maximum.

6. INLET AND OUTLET TANK BAFFLES- Typically, grease traps have adequate outlet baffles or drop tees to prevent the accumulated grease from exiting the unit. These components normally terminate from 6" to 12" above the tank floor. However, most grease traps are lacking any inlet baffle or control tee. A proper inlet baffle is important to keep the flow of grease laden water going in the right direction for separation. Without an inlet control baffle, the grease will pile-up at the inlet and short circuit the smooth, steady state flow through the tank necessary for maintaining design efficiency.

In conducting a proper cost-effective design of a grease trap, each one of these six key components has a direct relationship to the others. This is why a design cannot be satisfied with any one formula, in a one size fits all type of scheme.

Small Projects

by Al Vanderpoel, P.E.

When a large cost project is considered by a municipality, such as a sewer line extension, the budget includes a number of items such as construction, contingency, and design costs, permit applications, easements, administration, and other similar tasks. A good observation is that the larger the project, the more likely these costs will fall in line with standard percentages for each of the items. When they were previously called the Farmers Home Administration, the FmHA had charts that recommended the percentage of costs to be designated for design, inspection, and administration. These charts are still relevant when adjusted for inflation, even though the FmHA no longer uses this name. Likewise, the American Society of Civil Engineers has charts that estimate these same costs.

But, when a municipality has a small project, the costs are harder to estimate. For instance, when a water line repair, estimated at \$25,000 is needed to be done, the mandatory bidding requirements are still in effect, and essentially the same type of a contract and bidding documents must be put out as required with a million dollar project. Thus comes

the difficulty of estimating the engineering costs of preparing this work. No one wants to pay more for the design and preparation of a project than the actual cost of the project itself. On the other hand, an engineering firm cannot use the typical 10% design/administrative fee to put a project together when the construction cost is only \$10,000.

The task is to be creative and keep the project administration to a minimum when dealing with these small projects. Specifications can be taken from other similar projects, and can use the concept of an end result, rather than a lengthy performance based concept. Drawings can be based on standard detail drawings which have been previously prepared, rather than site specific exact drawings. In other words, the performance can be guided by a descriptive "this is what we want" wording. While this concept is risky with a million dollar project, as you may not get just what you are looking for, it typically works well with a small project.

The administrative costs can also be kept to a minimum. Requirements such as the newspaper advertisement, the bid opening, or some permitting requirements can be done by the municipality.

Keeping the engineers involvement to the technical details will keep the administrative costs to a minimum. The time spent on a small project ideally will focus on the technical design aspects, and leave the administrative items to the municipality. This keeps the project costs low, and does not sacrifice on the quality.

We at E & M Engineers and Surveyors have dealt with literally hundreds of small projects, and we would be glad to talk with you about your needs. We are very conscious about your costs and we have the experience to help you through these projects. The multitude of funding and state requirements must be met, and still a project can be put out at an affordable price. Give us a call and we will schedule a visit to go over your small project list.